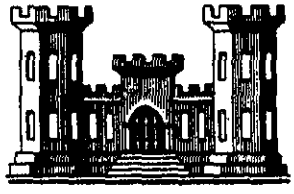
WATER RESOURCES INVESTIGATION

CONNECTICUT RIVER BASIN

SPRINGFIELD LOCAL PROTECTION

MODIFICATION STUDY

PLAN OF STUDY



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

OCTOBER 1977

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Department of the Army
New England Division, Corps of Engineers
Waltham, Mass.

October 1977

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Water Resources Investigation
Connecticut River Basin

Springfield Local Protection-Modification Study

Preface

This Plan of Study presents background information about the study area and the general procedures to be followed in determining the need for and advisability of modifying the existing Springfield Local Protection Project to provide a higher degree of flood protection for the city of Springfield, Massachusetts. Other allied purposes will be considered in developing and formulating the most economical and optimum plan which meets the needs and desires of the community. Portions of this Plan of Study will be subject to change as required by reason of continued coordination, communications, and findings.

In seeking solutions to the flood control needs of the city of Springfield, consideration will be given to the objectives of National Economic Development and Environmental Quality as well as Regional Development and Social Well-Being of the people. All significant adverse and beneficial project effects on the environment, including the aesthetics of the area, will be identified and assessed, and the feasibility of eliminating or minimizing adverse effects will be fully explored.

The Springfield Local Protection-Modification Study is a feasibility study of survey scope referenced by the Water Resources Council as Level C. This study will incorporate and update information from previous studies of the Connecticut River Basin at Springfield. Other water resource needs will be determined at public meetings and through coordination with various Federal and State agencies as well as local interests.

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PLAN OF STUDY

WATER RESOURCES INVESTIGATION
CONNECTICUT RIVER BASIN
SPRINGFIELD, MASSACHUSETTS

A. Authority for Study

1. Background.

Since its founding in the seventeenth century the city of Springfield has been subject to periodic flooding from the Connecticut and Mill Rivers. The greatest floods for which reliable records exist occurred in March 1936, September 1938, and August 1955.

Realizing the severity of the flooding problem the 69th Congress (First Session) passed House Document No. 308 on 21 January 1927, which directed the Corps of Engineers to conduct a flood control study of the Connecticut River. A report, taking the name "308 Report", dated 11 February 1936, was submitted to Congress with the recommendation that 10 flood control reservoirs be built on the tributaries of the Connecticut River in Vermont and Hew Hampshire. This report was the basis for the 1936 Flood Control Act which established a Federal interest in flood control.

Ironically, one month after the "308 Report" was submitted to Congress, the Connecticut River Basin experienced the disasterous flood of March 1936. As a result of this flood another study was made and reported in March 1937. New England Division, U.S. Army Corps of Engineers, "The Report of Survey and Comprehensive Plan for the Connecticut River", dated 20 March 1937. This report provided for the first general comprehensive plan for flood control for the basin and included 20 reservoirs with 10 alternative reservoirs and, most important, seven local protection projects at Hartford, East Hartford, Springfield, West Springfield, Chicopee, Holyoke, and Northampton. This comprehensive plan was approved in the 1938 Flood Control Act. Flood Control Act approved 28 June 1938, House Document No. 455, 7th Congress, 2nd Session.

There have been numerous modifications to the basic flood control plan over the years, but presently the Corps of Engineers has constructed a total of 16 dams and 19 local protection projects, including all seven of the original local protection projects in the basin.

Existing flood control structures in the basin are discussed in more detail in the 1970 report: "Connecticut River Comprehensive Water and Related Land Resources Investigation, Volume VIII." New England Division, U.S. Army Corps of Engineers, "Connecticut River Basin - Comprehensive Water and Related Land Resources Investigation", June 1970.

2. Authority.

A resolution of the Committee on Public Works of the United States Senate adopted 11 May 1962, recommended a review of existing reports in the Connecticut River Basin.

A seven year Federal-State study effort resulted in a report entitled "Comprehensive Water and Related Land Resources Investigation", dated June 1970. The coordination committee which guided this study recommended a 1980 basin plan which included the construction of additional flood control reservoirs to supplement the existing 16 reservoirs and seven mainstem local protection projects (including Springfield). Since 1970, the basin states have withdrawn support of the plan, consequently, the New England River Basins Commission (NERBC) chaired a supplemental flood control study of the Connecticut River Basin. The resulting report, "The Rivers Reach" includes recommendations to study reducing the possibility of overtopping by raising the existing dikes and floodwalls in East Hartford, Springfield, West Springfield, Chicopee, Holyoke, and Northampton in lieu of the seven additional flood control dams recommended in the 1970 CRB report. Other recommendations include construction of small dams and dikes where economic, environmental and social impacts and local cost sharing are acceptable and the utilization of effective non-structural solutions to flood plain management problems wherever possible.

The study of the Springfield Local Protection Project is authorized by the Flood Control Act of 1970, Title II, of Public Law 91-611 Section 216; which states:

> "The Secretary of the Army, acting through the Chief of Engineers is authorized to review the operation of projects constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures, or their operation, and for improving the quality of the environment in the overall public interest."

B. Purpose of Plan of Study

3. Purpose.

The purpose of the Plan of Study is to establish the procedure for conducting a study to determine the feasibility of modifying the existing flood control system in Springfield. This document will be used as a management tool to assist in direction and coordination of the investigation. The Plan of Study will:

a. Provide the planner with an advance planning tool for developing a plan of action.

b. Define at the earliest practicable date the anticipated problems associated with the analysis, formulation, policies, objectives, needs and scale of studies required during the course of the investigation.

c. Insure early and continuing coordination with other Federal, State, regional and local agencies and generate response from responsible and informed local groups. Early coordination is essential to avoid delay of investigations to the needs of the State and communities involved and acceptable to them.

d. Provide the Chief of Engineers with advance information on the nature of the investigation.

4. Study Objectives.

In seeking solutions to the flood control needs of the study area, consideration will be given to the national objectives for water and related land resources as stated in the Water Resource Council's "Principles and Standards". They are as follows:

National Economic Development - Maintaining or increasing the value of the Nation's output of goods and services as well as improving natural economic efficiency may be achieved through the development of water and related land resources. In accordance with this objective, the present and projected needs will be assessed for flood control, recreation, water quality, fish and wildlife, navigation, and other elements of water resource development. The annual costs of the measures for these purposes will be compared against the annual benefits in the interest of selecting projects based on national economic objectives.

Environmental Quality - The preservation and enhancement of the Nation's environmental resources is essential to insure their availablity for future use. The investigation will consider the preservation of natural and cultural areas, creation or restoration of scenic areas, preservation and enhancement of recreational areas, and the rehabilitation and protection of aesthetic values in the study area. In accordance with the National Environmental Policy Act of 1969, all available means will be utilized to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and to fulfill the social, economic, and other requirements of present and future generations.

Regional Development - The region's income gains and economic impact will be evaluated on the basis of possible expansion of business, industry, and recreation and on population and social development that could result from a comprehensive plan of improvement.

Social Well-Being - The social well-being of the greatest number of people shall be the overriding determinant in considering the best use of water and related land resources. Consideration will be given to project effects

on real income, security of life, health and safety, education, cultural and recreational opportunities, emergency preparedness, and other factors. Hardship and basic needs of particular groups within the general public shall be of concern, but care shall be taken to avoid resource use and development for the benefit of a few to the disadvantage of many.

C. Stage I Study Results

5. Resources and Economy.

a. Introduction. The city of Springfield is located in the south-central portion of Massachusetts on the eastern side of the Connecticut River. Midway between Albany and Boston, the city is the hub of the highly industrialized Springfield-Chicopee-Holoyke Standard Metropolitan S tatistical Area (SMSA).

b. Economy. As with many of the industrial areas in the New England region, early economic growth was dictated by the proximity of water. Springfield, settled in 1636, began to develop as the level of commercial activity on the Connecticut River increased. With the construction of an arsenal during the Revolutionary War manufacturing came to the city. Throughout the 1800's Springfield grew into a center for the manufacture of industrial and heavy machinery. During the early twentieth century these industries continued to be major employers, while the manufacture of printing and publishing products gained considerably as a source of employment.

Springfield's economic base as measured by employment is currently shifting from manufacturing to the areas of finance, services, public administration, and trade. Gains in employment in the chemical, printing and publishing, and transportation sectors of manufacturing have been more than balanced off by reductions in the areas of fabricated metals, machinery, food products, and textiles and apparel.[1]

In 1970, 29.7% of the labor force was employed in manufacturing, 48.8% in while collar occupations and 14.2%, respectively, for the SMBA and 29.2%, 52.7%, and 14.8%, respectively, for the State.[2] Thus the employment pattern exhibited in Springfield was characteristic of the region and the State.

The city is a slight exporter of labor, employing roughly 60,200 people in 1971, while possessing an employed labor force of 54,000 people in 1970. (Although the figures are not directly comparable they do give a rough estimated of the magnitude and direction involved.)

The employment pattern of Springfield residents has shifted slightly away from operatives, managers, and administrators towards those in the service related fields.[3]

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[1] A Comprehensive Plan for Springfield, Massachusetts. Springfield Planning Board. July, 1974. Page I-8, I-9.

[2] General Social and Economic Characteristics, Massachusetts 1970 Census of Population. Bureau of the Census. Tables 41,44.

[3] A Comprehensive Plan for Springfield, Massachusetts. Pages I-10.

c. Income. In terms of both median income and per capita income Springfield ranks behind the SMSA and the State. On a per capita basis the figures for these areas, as of the 1970 census, were $2,982 for Springfield, $3,229 for the SMSA, and $3,425 for the State while median income figures were $9,612, $10,369, and $10,835, respectively, for the same period.

Springfield's central city status vis-a-vis the SMSA and the State is also evident in figures on the percentage of all persons earning income below the poverty level. The figures were 12.7% for Springfield, 9.0% for the SMSA, and 8.6% for the State as of the 1970 census.

d. Population. The population growth in Springfield during the period from 1930 to 1970 (9.4%) has not been nearly as rapid as the growth rate in Hampden County (36.8%) and the State as a whole (33.3%). (See Table 1 for details). This differential is particularly evident during the last two decades during which these growth figures were .9% (1950), 24.8% (1960), and 21.3% (1970), respectively. The slowdown in the rate of population growth in Springfield was the result of several factors which affected many central cities, i.e., displacement by highway construction and urban renewal projects and the net migration of population to the suburbs.

Since 1970 this flow may have been stopping or reversing. For the first half of the 1970's the net outmigration for Springfield was zero in comparison to 22,741 persons between 1955 and 1965 and 34,181 during the period from 1960 to 1970.[4] Since 1969 there has been a large increase in the number of permits issued to build housing units. The planning commission envisions that a larger stock of housing units will attract an increased population. Because most available land is utilized for this housing growth the population growth will level off by the mid-1980's according to the commission. Planning commission population projections show a population in the range of 171,800-173,900 in 1980, 174,400-179,200 in 1985 and 176,200-183,200 in 1990.[5]

e. Land Use. Most of the land in Springfield is already committed to various urban uses. Fifteen percent of the land is listed as vacant, but this category includes numerous building lots and other small vacant parcels dispersed throughout developed areas; thus, the truly undeveloped portions of Springfield amount to less than 15% of its total area. Table 2 gives a breakdown of major land uses, while Table 3

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[4] City of Springfield. Massachusetts Department of Commerce and Development.

[5] A Comprehensive Plan for Springfield, Massachusetts. Page I-5.

TABLE 1

POPULATION

Year	Springfield Population	% Increase Over Past Period	Hampden County Population	% Increase Over Past Period	Massachusetts Population	% Increase Over Past Period
1930	149,900		335,496		4,269,612	
1940	149,554	-0.2	332,107	-1.0	4,316,721	1.6
1950	162,399	8.6	367,971	10.8	4,690,514	8.7
1960	174,463	7.4	429,353	16.7	5,148,578	9.8
1970	163,905	-6.1	459,000	6.9	5,689,170	10.5

Source: Bureau of the Census

TABLE 2

AREA OF MAJOR LAND USE CLASSES

Land Use Class	Acres	Percent
Residential	7,580	36.1
Single-family	(5,660)	(29.6)
Two-family	(1,100)	(5.3)
Multi-family	(820)	(3.9)
Commercial	1,120	5.3
Industrial	930	4.4
Institutional	1,420	6.8
Public Open Space	2,200	10.5
Vacant	3,200	15.2
Water	800	3.8
Streets	3,770	17.9
Totals	21,020	100.0

Source: Data Bank Real Estate File, September 1973
A Comprehensive Plan for Springfield Massachusetts 1974 1g, II-1

TABLE 3

Vacant Land by Zone Designation

Zone Designation	Vacant Acres	% Vacant Acreage
Residential	2,242	70.1
Commercial	14	0.4
Business	407	12.7
Industrial	537	16.8
Totals	3,200	100.0

Source: Data Bank Real Estate File, September 1973
A Comprehensive Plan for Springfield Massachusetts 1974

gives a further breakdown of the vacant land classification into its various zoning districts. The planning commission for Springfield envisions that the commercial land use pattern will not change greatly in the future, although some growth is expected in outlying commercial regions such as the Eastfield Mall. The 500 acres of vacant land which are zoned for industrial use consist of 300 acres of "primary" land which is almost completely located in East Springfield, as is much of the land labeled "secondary". (These are Planning Commission designations).

f. Transportation. Springfield is well serviced by transportation of all types. Major highway routes include I-91 and I-90 (the Massachusetts Turnpike); rail service is provided by Amtrak (passengers) and Conrail (freight). Interstate bus service is provided by several major lines, while air transportation is provided at the Westfield Municipal Airport, located 12 miles to the west, and Bradley International Airport which is located in Windsor, Connecticut, 15 miles to the south.

g. Conclusions. The city of Springfield may witness a slight period of growth in the near future. This will, however, give way to a limited but stable growth as the amount of undeveloped land is reduced.

6. Environmental Setting.

Springfield is located on the east bank of the Connecticut River about 80 miles from its mouth. The Connecticut River rises in the Connecticut lakes of northern New Hampshire adjacent to the Candadian border and follows a general southerly course along the approximate centerline of its watershed for about 404 miles to its mouth on Long Island Sound at Old Saybrook, Connecticut. The lower 60 miles of the river is tidal, with a mean tidal range during low river stages of 3.4 feet at the mouth and about 1.2 feet at Hartford. The fall in the river is about 2,200 feet with the steepest portion averaging 30 feet per mile occurring in the first 30 miles below the outlet of Third Connecticut Lake. From Wilder Dam, Vermont, past Springfield to the head of tidewater, eight miles above Hartford, Connecticut, the fall averages about 2 feet per mile. The Connecticut River basin, shown on Plate 1, has a total drainage area of 11,250 square miles.

The drainage area of the Mill River is 37 square miles. The basin is generally flat, having a maximum difference of elevation of only 250 feet, except for about four square miles of the extreme eastern fringe which rises another 600 feet and contains numerous small ponds and swampy areas which retain storm run-off and decrease flood flows.

Springfield is the second largest city in Massachusetts. It covers an area of approximately 33 square miles and has a population of 169,000.

The existing flood protection project in Springfield was completed in 1948. The protection consists of 8,200 feet of dike capped with concrete floodwall, 4,700 feet of concrete floodwall, 700 feet of earth dike all along the Connecticut River, and a conduit connecting the Mill and Connecticut Rivers. Also included in the protection works are seven pumping stations, five stoplog structures and appurtenant facilities for disposal of interior drainage.

The alignment of the protective works travels primarily adjacent to the Connecticut River and through diverse surroundings, including residential, commercial, and industrial areas. For the most part commercial and industrial establishments, sometimes in a state of disrepair, dominate the protected area. To adequately describe the environmental setting, it would be advantageous to divide the area into the sections protected by the existing project.

North Section (Plainfield Pumping Station to North End Bridge)

The protective works in this section consist of diked capped with a concrete floodwall approximately 8,200 feet long and between 3 and 9 feet high. Between the wall and river, for its entire length, there is well-established stands of vegetation. Red Maple, ash, and poplar trees of up to 10 inches in diameter are intermixed with other water tolerant plants forming a pleasing backdrop along the river. Landward of the wall are commercial and industrial facilities along Riverside Street. As one travels south toward the North End Bridge, he enters the Brightwood section of Springfield, a residential area. The concrete wall in this area reaches its highest point, about 9 feet above ground level, and obstructs the view of the river. The wall ties into an earth dike at the North End Bridge. Commercial establishments and a high-rise residential tower are situated in this area.

Center Section (North End Bridge to Memorial Bridge)

This section begins with an earth dike of approximately 3,000 feet. Riverside vegetation is again well-established and vigorous. The area landward of the dike is interspersed with commercial establishments and undeveloped wooded areas. The dike joins a five-foot concrete flood wall at the Clinton St. Pumping Station. This floodwall proceeds in a southerly direction adjacent to Clinton Street and ends at high ground at a stone embankment north of the Memorial Bridge. The wall provides protection to a few industrial buildings in a presently unmaintained area, with litter and trash scattered all around.

South Section (Memorial Bridge to South End Bridge)

The protective works in this section are concrete walls. The walls are intermittent since the section includes areas of high ground. Vegetation along the river is not as extensive as in the other two sections and grows along the bank which abuts the Boston & Maine railroad yard. This yard runs nearly the entire length of this section, serving the adjacent commercial and industrial establishments which dominate the area. A four foot concrete wall inside the yard and terminating at high ground in the vicinity of the South End Bridge provides flood protection along the southern portion of this section.

7. Hydrology.

a. General. The basic hydrology presented in this report was taken largely from prior hydrologic engineering studies pertaining to the study area. All pertinent data will be reviewed and updated as the progress of project reformulation studies warrant.

b. Climatology. Central Massachusetts has a variable climate characterized by frequent but usually short periods of precipitation. The region lies in the path of the "prevailing westerlies" from the west and southwest toward the northeast quadrant of the country. The area is also exposed to coastal storms, some of tropical origin, that travel up the Atlantic seaboard. Thunderstorms either of a local origin or associated with a frontal system, occur generally during the summer months.

c. Temperature. Average monthly temperatures in Springfield vary considerably throughout the year with a mean annual temperature of about 51° Fahrenheit. Summer temperatures average from the upper sixties to lower seventies, with winter temperatures averaging in the upper twenties to lower thirties. Freezing temperatures can be expected from the middle of November until the end of March.

d. Precipitation. The average annual precipitation at Springfield is about 45 inches, distributed rather uniformly throughout the year. Maximum and minimum annual precipitation, recorded over 128 years at the Springfield Armory, is 62.6 and 31.0 inches, respectively.

e. Snowfall and Snow Cover. Based on 78 years of record, snowfall at Springfield averages about 49 inches. Water content of the snow cover in the region reaches a maximum depth about the first of March varying from zero to 6.0 inches of water equivalent with a mean of about 2.9 inches.

f. Streamflow. A continuous record of streamflow has not been maintained on the Connecticut River at Springfield. However, the USGS operates a stream gauging station on the Connecticut River at Thompsonville, Connecticut about eight miles downstream of Springfield. Discharges at Thompsonville are considered representative of Connecticut River flows in the lower section of Springfield. The total drainage area at the gauge is 9,661 square miles. Based on the 47-year record of the gauge, the average annual flows is derived at 16,270 cfs, equivalent to an annual runoff of 22.9 inches or about 50 percent of annual precipitation.

g. Flood History. Damaging floods have been experienced on the Connecticut River and its tributaries since the establishment of the first settlements in the basin. Records of peak flood stages on the Connecticut River at Springfield have been maintained by the National Weather Service dating back to 1869. The gauge is located at the Memorial Bridge just upstream of the confluence of the Westfield River.

The greatest flood of record on the lower Connecticut River was experienced on March 1936 when a stage of 28.6 feet (65.9 feet msl) was reached at the Springfield gauge. The second greatest flood occurred in September 1938, with a level 2.9 feet below the 1936 stage.

Historic flood levels at Springfield versus peak flows at Thompsonville, Connecticut are listed in Table 4.

TABLE 4

HISTORIC FLOOD LEVELS
SPRINGFIELD, MASSACHUSETTS

Date	Flood Level at Memorial Bridge (ft msl)	Discharge at Thompsonville, Conn.
Mar 1936	65.9	282,000
Sep 1939	63.0	236,000
Nov 1927	59.7	190,000
Aug 1955	58.4	174,000
Apr 1960	57.3	156,000

8. Level of Flood Protection.

a. Flood Frequencies. Discharge frequency curves for the Connecticut River at Thompsonville, Connecticut are shown on Plate 13. These curves respresent natural and modified peak flow frequencies. The natural frequencies are graphical presentations of the data tabulated in Table C-10, Appendix C, of the June 1970 Connecticut River Comprehensive Report.[1] Peak discharge frequencies were determined by a regional analysis using a Long Perason Type III analysis as described in Water Resources Council Bulletin No. 15, entitled "A Uniformed Technique for Determining Floodflow Frequencies."[2]

b. Effect of Reservoirs. Since the great floods of March 1936 and September 1938, the Corps of Engineers has constructed a system of 13 flood control reservoirs in the Connecticut River Basin which control flood runoff from 1,430 square miles, or 15 percent of the Connecticut River watershed above Springfield. Typical flood reductions provided by the existing system of reservoirs at Springfield and Thompsonville are illustrated by the natural and modified stage and sicharge frequency curves shown on Plates 3 and 4. It is cautioned that for every occurrence

[1] New England Division, U.S. Army Corps of Engineers, "Connecticut River Basin - Comprehensive Water and Related Land Resources Investigation", June 1970.

[2] Water Resources Council, Hydrology Committee, "A Uniform Technique for Determining Flood Flow Frequencies," Bulletin 15, Washington, D.C., 1967.

of a certain frequency flood the reduction will not be exactly as indicated by the modified frequency curves. The magnitude of reduction will vary depending on the storm orientation with respect to the upstream reservoirs. The modified frequency curves shown represent the expected average or typical reduction as determined by analyses using the "Typical Tributary Contribution Flood," as developed by the New England Division, Corps of Engineers.[3]

Reductions in discharges and stages that would be provided by the system in the recurrence of the specific 1936 and 1938 historical floods at Springfield are listed in Table 5.

c. Original Design Flood. The Springfield protective works were designed for a Connecticut River flow at Springfield of 246,000 cfs, equivalent to a design flood stage of 63.6 feet msl at the Memorial Bridge (Report, reference 6). The original 1937 design flood was developed by modifying a natural flow of 312,000 cfs by the then proposed 20-reservoir system. The design flood was produced by approximately 7.2 inches of runoff from the basin and was estimated, at that time, to be about a 1,000-year frequency event.

Following the record rainstorm experienced in September 1938 in New England, a new design flood was developed for the Connecticut River Basin and reported in 1944.[4] This revised design flood was developed by orienting the 1938 storm over the basin to produce maximum uncontrolled runoff, assuming high antecedent moisture conditions. Further studies were also made of the 20-reservoir system included in the Comprehensive Plan of House Document No. 455.[5] Based on these studies, a revised plan which included a 29-reservoir system was selected for inclusion in the revised Comprehensive Plan. These studies resulted in a new design natural and modified flow would be equivalent to a stage of about 64.7 feet msl at Memorial Bridge in Springfield. The revised design flood was reported in 1944; however, the Springfield project was partially completed and was not modified.

Due to the indefinite schedule of reservoir construction at the time the Springfield project was constructed, the earth dikes were built to provide 5 feet of freeboard above the original design flood level. Concrete walls were built with 3 feet of freeboard.

[3]New England-New York Inter-Agency Committee, "The Resources of the New England-New York Region," Reference Data, dated March 1955.

[4]New England Division, U.S. Army Corps of Engineers, "Review of Reports on Surveys of the Connecticut River and Tributaries for Flood Control," dated 28 February 1940, Revised 18 December 1944.

[5]Flood Control Act approved 28 June 1938, House Document No. 455, 75th Congress, 2nd Session.

TABLE 5

EFFECT OF EXISTING RESERVOIRS ON FLOODS OF RECORD

Event	Obeserved		Modified by 13 Existing Reservoirs*	
	Discharge**	Elevation	Discharge (cfs)	Elevation (ft msl)
Mar 1936	282,000	65.9	211,600	61.4
Sep 1938	236,000	63.0	189,200	60.0

*Existing reservoirs include Union Village, North Hartland, North Springfield, Ball Mountain, Townshend, Surry Mountain, Otter Brook, Birch Hill, Tully, Barre Falls, Conant Brook, Knightville, Littleville

**Discharges at USGS gage at Thompsonville, Connecticut. Elevations at Memorial Bridge, Springfield, Connecticut.

d. Standard Project Flood. A standard project flood (SPF) was developed for the lower Connecticut River Basin in 1970 in conjunction with the Connecticut River Basin Comprhensive Study.[6] Its primary purpose was to test the lower basin flood potential with the existing system of reservoirs in operation. The standard project storm was therefore oriented to produce maximum runoff from the uncontrolled drainage area in the lower central portion of the Connecticut River Basin. The storm was assumed to occur with relatively high antecedent moisture conditions, producing a base flow in the river of about 8 cfs square miles.

The resulting standard project flood had a natural and modified peak flow at Thompsonville of 443,000 and 349,000 cfs, respectively. The accompanying modified flood stage at Springfield Memorial Bridge would be 69.8 feet msl.

Design flood comparisons relative to flood levels at Springfield are presented in Table 6.

TABLE 6

DESIGN FLOOD COMPARISONS

Flood	Springfield Flood Elevation (Memorial Bridge)	Thompsonville Discharge (cfs)
1937 Design Flood*	63.6 ft msl	246,000
1944 Revised Design Flood**	64.7 ft msl	263,000
1970 Standard Project Flood***	69.8 ft msl	349,000

*Modified by the then proposed 20-reservoir system
**Modified by the revised plan of 29 reservoirs
***Modified by existing 13-reservoir system

[6]New England Division, U.S. Army Corps of Engineers, "Connecticut River Basin - Comprehensive Water and Related Land Resources Investigation," June 1970.

TABLE 7

SPRINGFIELD LOCAL PORTECTION PROJECT COMPARATIVE HEIGHTS OF PROTECTION

Location	Station	Existing Height of Protection	SPF Level	SPF Level Plus Freeboard
North end of wall	62+10	68.7	72.1	74.1
Pumping Station No. 1	40+00	68.3	71.7	73.7
Pumping Station No. 2	10+00	67.8	71.2	73.2
North End Bridge (dike)	0+75	69.7	70.9	73.9
Pumpint Station No. 3 (dike)	133+20	69.1	70.3	73.3
Memorial Bridge (Wall "A")	2+52	66.4	69.8	71.8
Pumping Station No. 6 (Wall "B")	7+14	65.8	69.2	71.2
South End Bridge (dike)	16+56	65.6	69.0	71.0
South End Bridge (dike)	20+07	67.8	69.0	72.0
NYNHH RR Bridge (Wall "C")	2+43	65.8	69.2	71.2

e. Height of Protection. As previously discussed, the existing project was designed, with freeboard, to protect against a flood level 63.6 feet above mean sea level at the Springfield Memoridal Bridge. Hights of protection, at selected stations are listed in Table 7. The general plan of the area and the operation chart is shown on Plate 2.

f. Stage Discharge Rating. A curve relating the discharge of the Connecticut River at Thompsonville with flood levels at the Memorial Bridge in Springfield is shown on Plate 5. This curve was developed from historical stage-discharge relations. The level of the SPF relative to the existing design level is also indicated on Plate 5.

g. Freeboard.

(1) General. Freeboard is the vertical distance measured from the design water surface to the top of a dike or wall. Freeboard is provided to allow for uncertainties in hydraulic computations and to ensure that the desired degree of protection will not be reduced by unaccounted factors.

(2) Original Design. A uniform freeboard of 3 feet for both concrete walls and earth embankment was originally proposed for the Springfield Local Protection Project. However, since the entire reservoir plan would not be effective for some time, the Board of Rivers and Harbors recommended the earth section be raised 2 feet. A design freeboard of 5 feet for earth dikes and 3 feet for the concrete walls was, therefore, originally adopted.

(3) Present Practice. Present freeboard practice allows for 3 feet of freeboard for earth dikes and 2 feet for concrete walls. Less freeboard is needed for concrete walls because they would have greater resistance to failure if overtopping were to occur.

9. Problem Identification.

The Connecticut River Basin has experienced numerous floods in the past, several of which have taken the lives of some basin residents and brought huge financial burdens to bear upon others. A summary of experienced losses from four of the most disasterous floods are shown in Table 8.

TABLE 8

FLOOD LOSSES OF FOUR HISTORIC EVENTS
CONNECTICUT RIVER BASIN

Date of Event	Number of Lives Lost	Reported Monetary Damage
November 1927	21	$ 29,000,000
March 1936	11	66,400,000
September 1938	8	48,600,000
August 1955	34	119,000,000

There are at present twenty-five specified and one unspecified (alternative to Sugar Hill on the Ammonoosuc River) authorized reservoir projects in the entire Connecticut Basin, and of this number 16 have been constructed. Five of the constructed projects, authorized after the lower basin tributary flood of 1955, were designed to meet tributary flood control needs and have limited effect on the Connecticut River main stem.

Of the ten remaining unconstructed flood control reservoirs deauthorization recommendations have been made for nine and before the close of calendar year 1977 they will be off the rolls. At that time only the Beaver Brook reservoir project in New Hampshire will remain as authorized.

There is a significant need to control a greater portion of the drainage area above Springfield or to employ alternative means of providing the desired degree of protection which was originally planned. Construction of previously authorized reservoirs has been abandoned as an alternative because upper basin states have withdrawn their support. It is therefore considered prudent to provide additional protection by modifying the existing system of dikes in the principle damage areas, including Springfield.

10. Formulation of Alternatives.

Previous water resource studies of Springfield and the Connecticut River Basin considered a multitude of structural and non-structural alternatives designed to meet the flood control needs of the basin. Initially, addtiional upstream storage appeared to be the best method of achieving the desired level of protection at the principle damage areas, however, the upstream states have withdrawn their support for such a plan. For this reason other alternatives were evaluated and it now appears that the most acceptable structural solution would be to raise the height of the existing local protection projects. It is the purpose of this study to formulate various dike raising plans with an eye toward optimizing the level of protections. Protection will not be limited to those areas presently behind the dike but may include other flood prone areas if incrementally justified. In addition to evaulating the above structural options, non-structural alternatives will be considered and recommended if found to be more prudent than dike raising. Finally, since it is our objective to arrive at a solution which meets the needs of the city, recreation or any other water related purpose other than flood control maybe included if there is local desire for a multi-purpose project.

11. Impact Assessment & Evaluation.

The assessment will cover all environmental, social, and economic effects following the guidelines established by ER 1105-2-105 to insure that all significant adverse and beneficial project effects are taken fully into account.

Project encouragement of development trends will be carefully assessed to assure preservation of environmental resources. On the other hand, controlled development and wise usage of areas rendered free of flood threat may produce social benefits justifying work improvements. The resulting decisions and project recommendations will be made in the best overall interests of the public with a balance maintained between elements of dollar benefits and costs, the degree of satisfaction of public needs, and the extent of other types of effects. To accomplish this, the tentative profile of existing conditions obtained from this and prior studies will be augmented to show projections of conditions with and without the project or alternatives over the life of the project. Significant effects will be identified and evaluated. Any desireable project modification revealed by the assessment will be considered. Evaluation is the process through which values are assigned to the impacts and is being accomplished by interpreting whether the consequences of the alternatives are beneficial or adverse in relation to the objectives and desires of residents of the study area. This process, augmented by public contacts, will provide local interests with the opportunity to express their views regarding alternatives and their effects.

D. Study Effort

12. Public Involvement.

Initiation of the study was made in December 1976 with the distribution of an announcement (See Appendix 1) which explained the nature of the study and encourage public officials and the general public to express their views and to make known any problems or needs of which we were not aware. A letter supporting the study from the Mayor of Springfield can be found in Appendix 2. Further coordination will be maintained with other Federal, State and local agencies. Regional planning and conservation associations will be involved in the planning process through utilization of workshop-type meetings. Regular progress meetings will be held to receive local input into the study and to inform agencies of progress during the course of the study. The public participation program will be kept flexible and responsive to the needs of all concerned local officals, private agencies and individual interests. A formal public meeting will be conducted during the formulation stage of the study and a late stage public meeting, if required, will be held at the conclusion of the study.

13. Coordination.

Coordination measures are continuing through conference and correspondence. Each stage of the study will be presented for comment or concurrence by other Federal, State, regional, local and civic agencies having an interest in planning or development of water resources in the study area.

14. Estimated Costs.

The preparation of budgetary data for the Springfield Local Protection Modification Study is predicated upon the estimate amount of money needed to complete the work items necessary for a Level C Study. The distribution

of funds will provide for an assessment of the need for additional flood protection and development of intermediate alternative solutions in FY 1977 and the development and evaluation of final alternatives in FY 1978.

15. Anticipated Schedules.

The next stage of planning involves a thorough analysis of the problems identified and will conclude with a public presentation of a preliminary range of solutions, including initial plans and cost estimates. Those alternatives will be evaluated and refined and the remaining alternatives will be studied in detail during the third planning stage. This stage involves the formulation of detailed alternative plans and concludes with the preparation of the final report. Completion of the study is scheduled for September 1978.

16. Constraints and Controls.

To date, funding to complete this Plan of Study and to initiate preliminary planning has been made available. Studies will be continued only so long as a possibility remains that a workable, economically feasible, and environmentally and socially acceptable plan of improvement can be recommended.

17. Submission of Reports.

Plan of Study - This report constitutes the Plan of Study.

Final Feasibility Report - The submission of the feasibility report is currently scheduled for September 1978. This date is dependent upon future Congressional appropriations.

Recommendation - Approval of this Plan of Study on investigations for additional flood protection in Springfield, Massachusetts is recommended.

BIBLIOGRAPHY AND REFERENCES

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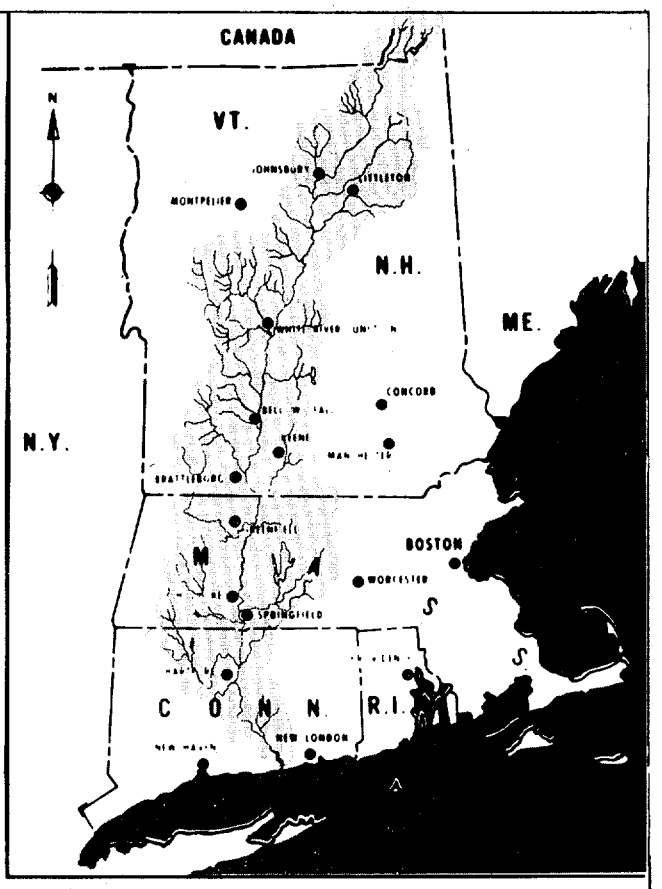
2. Flood Control Act approved 28 June 1938, House Document No. 455, 75th Congress, 2nd session.

3. New England Division, U.S. Army Corps of Engineers, "Connecticut River Basin - Comprehensive Water and Related Land Resources Investigation", June 1970.

4. Water Resources Council, Hydrology Committee, "A Uniform Technique for Determining Flood Flow Frequencies", Bulletin 15, Washington, D.C., 1967.

5. New England - New York Inter-Agency Committee, "The Resources of the New England - New York Region", Reference Data, dated March 1955.

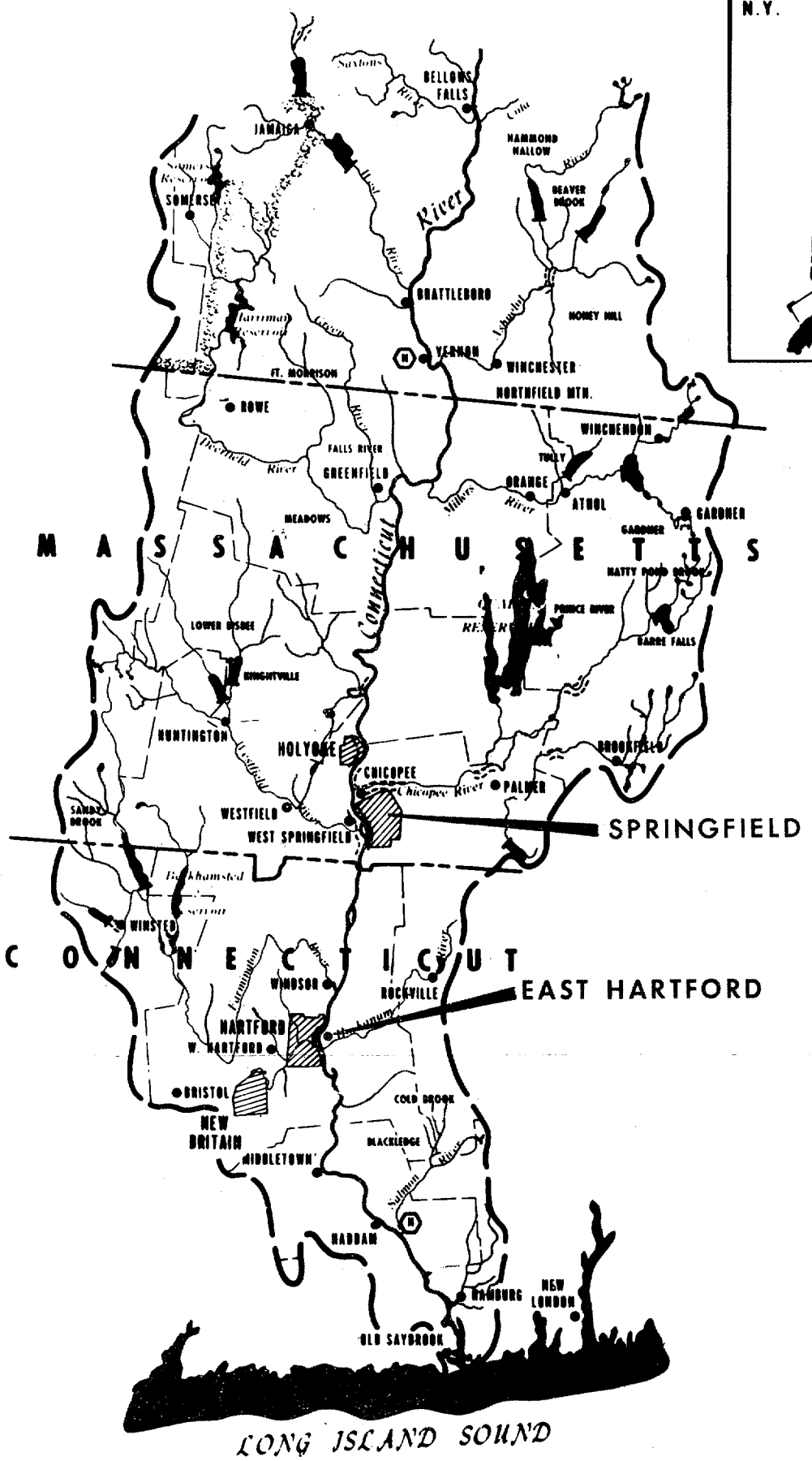
6. New England Division, U. S. Army Corps of Engineers, "Review of Reports on Surveys of the Connecticut River and Tributaries for Flood Control", dated 28 February 1940, Revised 18 December 1944.



N

N E W

H A M P S H I R E



CONNECTICUT RIVER BASIN

CORPS OF ENGINEERS STUDY AREAS

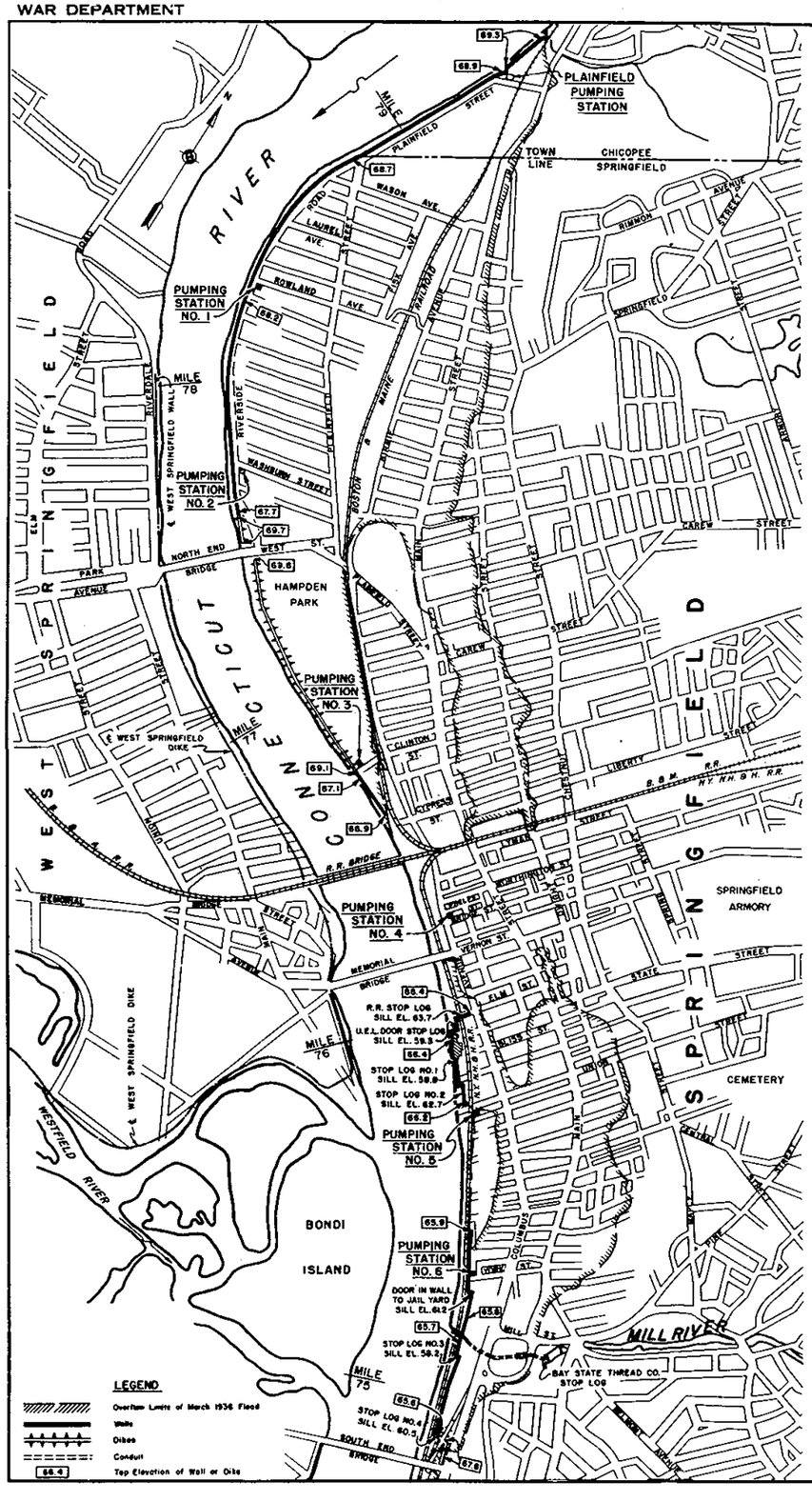
SCALE IN MILES

0 8 16 24 32 40

PLATE 1

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



28 ft.

27 ft. — Place sand bags across Elm St. at Columbus Ave. (Plate No. VII)

26 ft. — Place sand bags across N.Y. N.H. & H. R.R. Co. tracks at Elm St. underpass. (Plate No. VII)
Place sand bags across N.Y. N.H. & H. R.R. Co. tracks at Union St. (Plate No. VII)

25 ft. — NOTE: Top of recording gage.
Above this point temporary gages are established.

24 ft. — Close door in river wall at York St. Jail. (Plate No. VIII)
Place stop logs in wall at Bay State Turbine Outlet. (Plate No. XXV)
Place stop logs in wall at Springfield Gas Light Co. property at foot of Union St (Plate No. VII)

23 ft. — Place stop logs in wall at South St. R.R. yard entrance near South End Bridge. (Plate No. IX)

22 ft. — Shut gate valve in pipe through wall at back of the Bay State Thread Co. (Plate No. XXV)

21 ft.

20 ft. — Place stop logs in north doorway at United Electric Light Company. (Plate No. VII)
Place stop logs in wall at foot of Bliss Street. (Plate No. VII)
Place stop logs in wall at west end R.R. driveway to South St. R.R. yard. (Plate No. IX)
Close gate valve in wall drain on United Electric Light Co. property between Bliss and Union Streets. (Plate No. VII)

19 ft. — Close backwater gates in Worthington Street sewer. (Plate No. XVI)
Close 12" sluice gate in Bridge Street sewer. (Plate No. XV)
Start operation of Phelps Avenue Pumping Station No. 4. (Plate No. XVII)
NOTE: If the sewage flow in the outfall sewers is normal and the regulators are open, it may be unnecessary to continue the operation of the Phelps Avenue Station.

18 ft. — Close backwater gates in Clinton Street sewer. (Plate No. XIX)
Close backwater gates in Cypress Street sewer. (Plate No. XVIII)
Open 4'x 3' sluice gate in Cypress Street sewer. (Plate No. XVIII)
Close 4'x 4' sluice gate in Interceptor sewer at Cypress Street. (Plate No. XVIII)
Check flap valves in 24" drain at Cypress Street. (Plate No. XVIII)
Start operation of Clinton Street Pumping Station No. 3. (Plate No. XIX)
NOTE: If the sewage flow in the outfall sewers is normal and the regulators are open, it may be unnecessary to continue the operation of the Clinton Street Station. When the station is not in operation, be sure that the 4'x 3' sluice gate in Cypress Street sewer is closed and the 4'x 4' sluice gate in Interceptor sewer at Cypress Street is open.

17 ft.

16 ft. — Close backwater gates in Wason Ave. sewer. (Plate No. XXIV)
Close backwater gates in Rowland Ave. sewer. (Plate No. XXII)
Close gate valve in Laurel Ave. sewer. (Plate No. XXIII)
Start operation of Rowland Ave. Pumping Station No. 1. (Plate No. XXII)
NOTE: If the flow in the Rowland Ave. sewer and in the Wason Ave. and Laurel Ave. sewers is normal and the regulators are open, it may be unnecessary to continue the operation of the Rowland Ave. Pumping Station. However, the power should be left on and the station set for automatic operation whenever the River Gage reads 15.0 or more.
At Springfield St., just northeast of Chestnut St., all flow may be diverted into the upper end of the Pressure Sewer, thereby reducing the quantity pumped at Station No. 1.

15 ft.

14 ft. — Close backwater gates in Elm St. sewer. (Plate No. XIV)
Open 36"x 24" sluice gate in Elm St. sewer in regulator chamber. (Plate No. XIV)
Start operation of Union St. Pumping Station No 5. (Plate No. XIII)
Close interceptor sluice gate. Open sluice gate inside pumping station.
NOTE: If the flow in the various outfall sewers is normal and the regulators are open, it may be unnecessary to continue the operation of the Union Street Station.

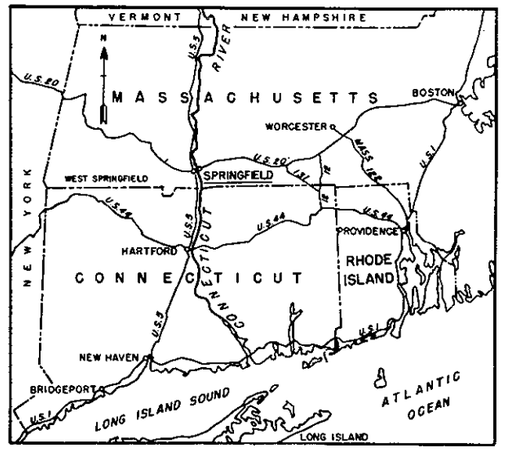
13 ft. — Close backwater gates in Washburn St. sewer. (Plate No. XXI)
Open sluice gate on inlet conduit. (Plate No. XXI)
Check flap gates on West St. drain. (Plate No. XX)
Start operation of Washburn St. Pumping Station No. 2 (Flood pumps)
NOTE: If flow is normal and regulator is open, it may not be necessary to continue the operation of the large flood pumps at the Washburn St. Station. Power should be left on, however, and an operator in attendance, or controls left on float control.
Close 42" sluice gate at entrance chamber of siphon in Columbus Ave. sewer at Mill River (Plate No. X)
Close backwater gates in York St. sewer. (Plate No. XII)
Close backwater gates in Union St. relief sewer. (Plate No. XIII)
Close backwater gates in Union St. sanitary sewer. (Plate No. XIII)

12 ft.

CONNECTICUT RIVER GAGE

RECORDING GAGE LOCATED IN WESTERLY PIER CENTER SPAN, MEMORIAL BRIDGE, SPRINGFIELD, MASS.
ZERO OF GAGE IS ELEVATION 37.3 MEAN SEA LEVEL.

SCHEDULE OF OPERATIONS



LOCATION MAP

SCALE OF MILES 0 10 20 30

NOTES

STOP LOGS

When the elevation of the Connecticut River reaches El. 57.3 or river gage reads 20 feet, Stop Logs should be delivered at the following locations and should be in position when the river gage reaches the readings shown below.

Gage 20 ft. (1) North doorway at United Electric Light Company Elev. 59.3

Gage 20 ft. (2) Riverwall at foot of Bliss St. Elev. 58.8

Gage 20 ft. (3) Riverwall at west end R.R. driveway to South St. R.R. yard. Elev. 58.2

Gage 23 ft. (4) South St. R.R. yard entrance near South End Bridge. Elev. 60.5

Gage 24 ft. (5) Riverwall at Spfld. Gas Light Co. foot of Union Street. Elev. 62.7

Gage 24 ft. (6) Wall at turbine outlets Bay State Thread Co.

SAND BAGS

Sand bags should be filled and delivered to the following locations when the river reaches elevation 57.3 or the river gage reads 20.0

SAND BAGS SHOULD BE PLACED IN POSITION AT RIVER GAGE READINGS SHOWN BELOW

Gage 20 ft. (1) Riverwall at foot of Bliss Street.

Gage 20 ft. (2) Riverwall at west end of R.R. driveway to South St. R.R. yard.

Gage 23 ft. (3) South St. R.R. yard entrance near South End Bridge.

Gage 24 ft. (4) Door in Riverwall at York St. jail.

Gage 24 ft. (5) Riverwall at Spfld. Gas Light Co., foot of Union St.

Gage 26 ft. (6) N.Y., N.H. & H. R.R. Co. tracks at Elm St. underpass.

Gage 26 ft. (7) N.Y., N.H. & H. R.R. Co. tracks at Union Street

Gage 27 ft. (8) Elm Street at Columbus Avenue.

CONNECTICUT RIVER FLOOD CONTROL

FLOOD PROTECTION SYSTEM

SPRINGFIELD, MASS.

OPERATIONS CHART

IN 1 SHEETS — SCALE: 1 IN. = 800 FT (800' 0 800' 1600') — SHEET NO. 1

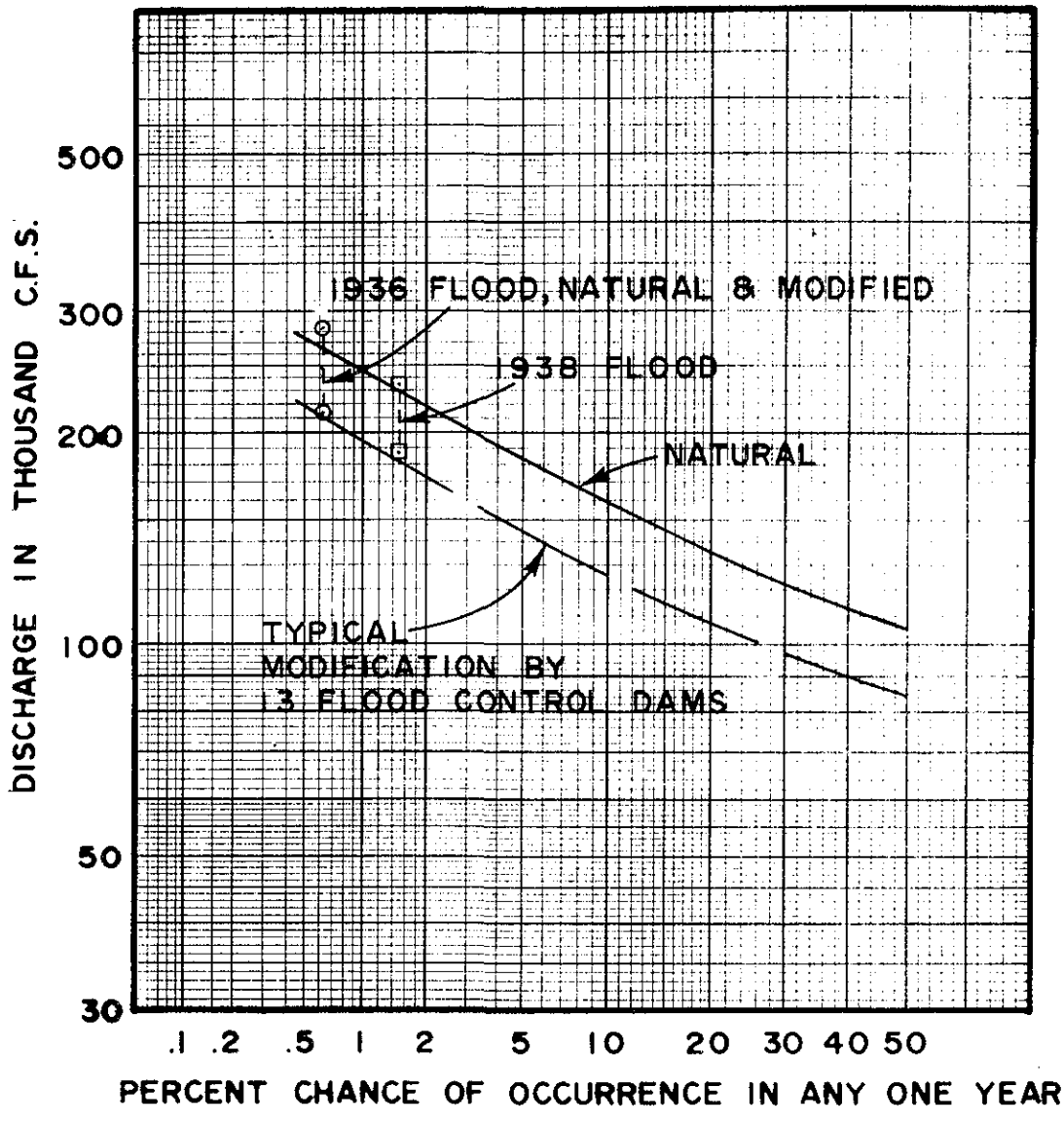
U. S. ENGINEER OFFICE, PROVIDENCE, R. I., MARCH 1945

SUBMITTED: James A. Robertson, SENIOR ENGINEER OPERATIONS DIV.
APPROVAL RECOMMENDED: Carl H. Larson, SENIOR ENGINEER & CHIEF, OPERATIONS DIVISION
APPROVED: W. E. Gross, COL., CORPS OF ENGINEERS, DISTRICT ENGINEER

DRAWN: D.H.R., L.H.
TRACED: D.H.R.
CHECKED: [illegible]

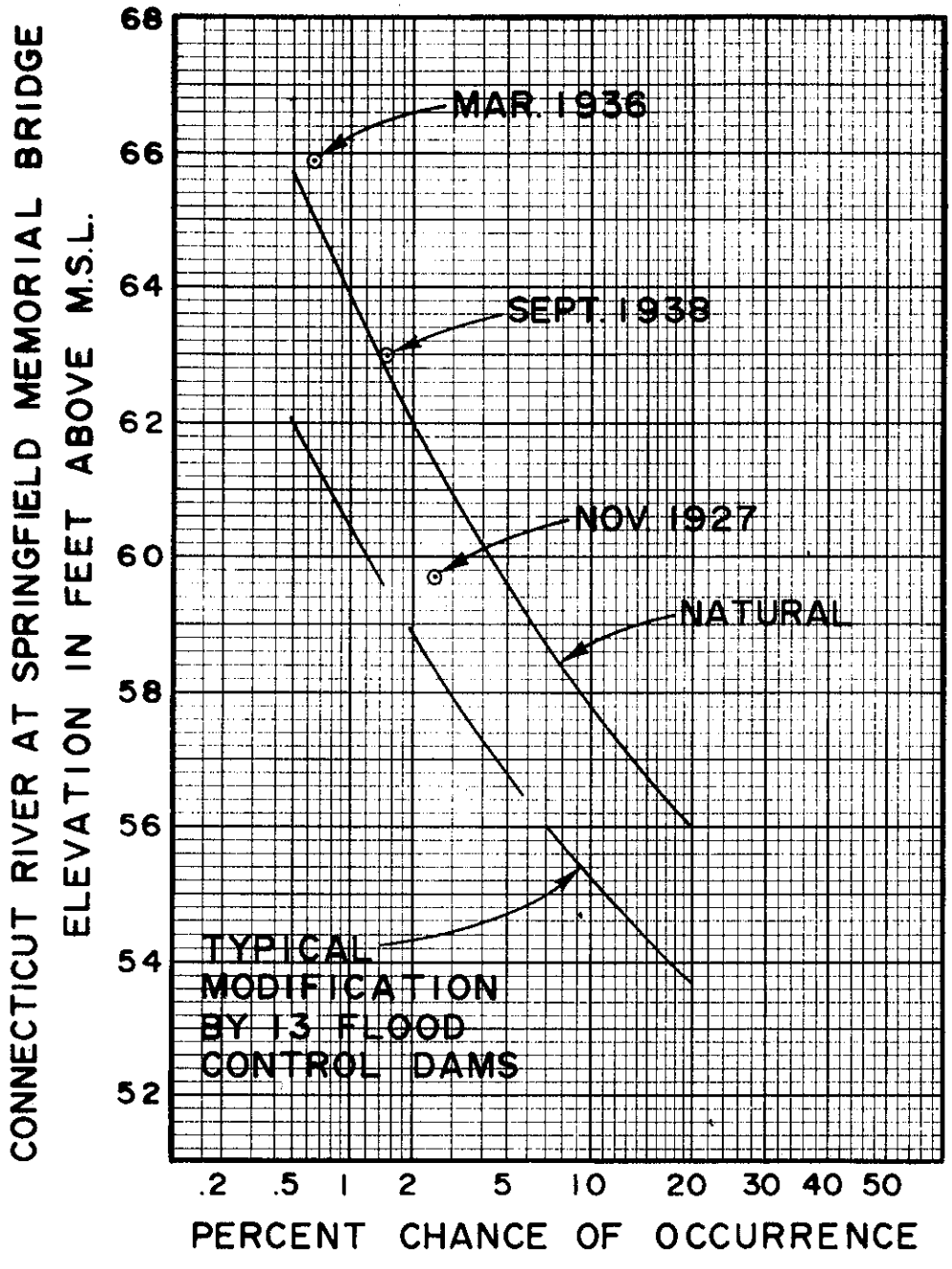
FILE NO. CT-4-3443

PLATE 2



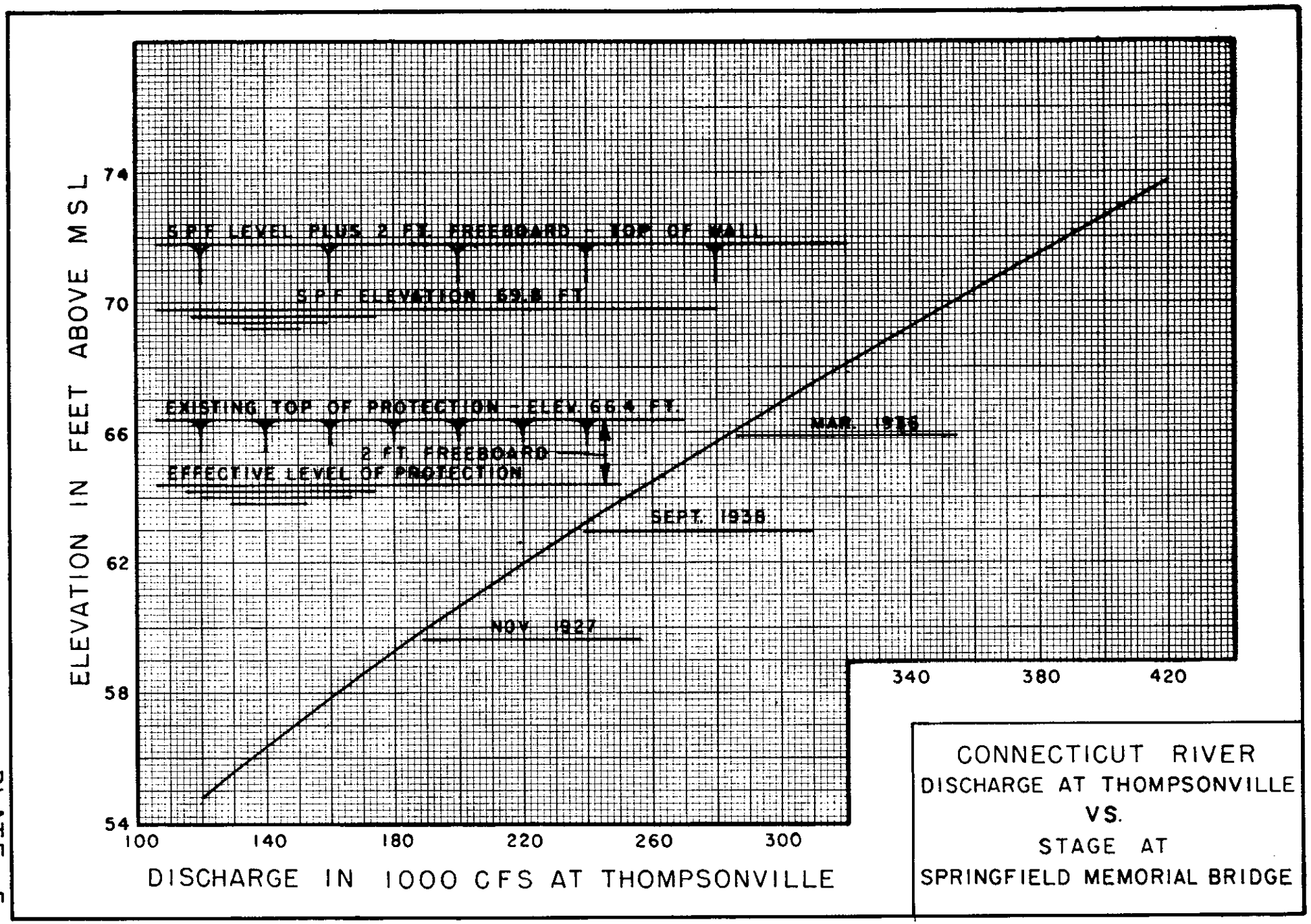
CONNECTICUT RIVER
DISCHARGE FREQUENCY CURVE AT THOMPSONVILLE, CONNECTICUT

PLATE 3



CONNECTICUT RIVER
ELEVATION FREQUENCY
CURVE
SPRINGFIELD MEMORIAL BRIDGE

PLATE 4


ELEVATION IN FEET ABOVE MSL
74
70
66
62
58
54
S.P.F. LEVEL PLUS 2 FT. FREEBOARD - TOP OF WALL
S.P.F. ELEVATION 69.8 FT.
EXISTING TOP OF PROTECTION - ELEV. 66.4 FT.
2 FT. FREEBOARD
EFFECTIVE LEVEL OF PROTECTION
MAR. 1936
SEPT. 1938
NOV. 1927
100
140
180
220
260
300
340
380
420
DISCHARGE IN 1000 CFS AT THOMPSONVILLE
CONNECTICUT RIVER
DISCHARGE AT THOMPSONVILLE
VS.
STAGE AT
SPRINGFIELD MEMORIAL BRIDGE

PI ATF 5

APPENDIX 1: STUDY ANNOUNCEMENT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDPL-P

30 December 1976

ANNOUNCEMENT OF INITIATION OF A STUDY

TO

DETERMINE THE FEASIBILITY OF RAISING
THE EXISTING FLOOD CONTROL SYSTEM

IN

SPRINGFIELD, MASSACHUSETTS

The New England Division, Army Corps of Engineers, announces the initiation of a study to determine the feasibility of raising the existing system to provide a higher degree of flood protection for the highly developed sections of Springfield. The primary purpose of this announcement is to provide all interested parties with the opportunity to submit their views and opinions concerning the proposal early in the planning stage to insure that the needs and desires of the public are incorporated wherever possible.

The Report of the Connecticut River Comprehensive Study published by the Corps of Engineers in 1970 recommended the construction of seven additional reservoirs to supplement the existing 16 reservoirs and seven mainstem Connecticut River local protection projects in order to provide the desired level of flood protection. Since 1970 the Basin States have withdrawn their support of the seven additional reservoirs as a means of providing the needed level of protection in six mainstem urban communities (including Springfield) which now have local protection projects. The New England River Basin Commission in its revised draft study report, the River's Reach, recommended that this study be made.

The flood control project, situated along five miles of the east bank of the Connecticut River, was constructed in segments beginning in 1937 and ending in December 1948. Six pumping stations constructed by the city were incorporated in the protective system.

Included in the protective works are 700 feet of earth dikes, 8,200 feet of dike capped with concrete floodwall, 4,700 feet of concrete floodwall, 1,700 feet of concrete conduit carrying the discharge of the Mill River, wingwalls along the Mill River above two dams and a highway bridge, five stoplog structures, one pumping station, and miscellaneous drainage structures to supplement the city systems for disposal of interior drainage.

The improvement protects two large, low areas totalling 820 acres located in the northern and southern section of the city. The protected area contains important railroad, industrial and commercial property, in addition to numerous small commercial buildings and residences. The total cost of the project was $1,209,000 of which $277,000 was non-Federal costs. Past operations have prevented nearly six million dollars in flood damages.

This study will investigate the engineering feasibility, economic justification, environmental and social effects of modifying the existing local protection project to attain a higher degree of flood protection. The first stage of the study will concentrate on problem identification. It is essential that all potential problems, needs and desires of the community surface now to insure early consideration during the planning process. Subsequent to this primary stage of the study, alternatives will be formulated, evaluated and presented at a public information meeting during the fall of 1977.

A preliminary mailing list has been developed. If you know of others with an interest in this project please make this notice known to them. Comments concerning this study and requests to be added to the mailing list may be made at any time by writing to:

Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02154

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

MAILING LIST

ANNOUNCEMENT OF INITIATION OF A STUDY
TO
DETERMINE THE FEASIBILITY OF RAISING THE EXISTING FLOOD CONTROL SYSTEM
IN SPRINGFIELD, MASSACHUSETTS
30 DECEMBER 1976

CONGRESSIONAL

Hon. Edward W. Brooke, U.S.Senate, Washington, DC 20510
Hon. Edward W. Brooke, 2003H JFK Federal Building, Boston, MA 02203

Hon. Edward M. Kennedy, U.S. Senate, Washington, DC 20510
Hon Edward M. Kennedy, 2400A JFK Federal Building, Boston, MA 02203

Hon. Silvio O. Conte, House of Representatives, Washington, DC 20515
Hon. Silvio O. Conte, 100 North Street, Suite 305, Pittsfield, MA 02101

Hon. Edward P. Boland, House of Representatives, Washington, DC 20515
Hon. Edward P. Boland, 1883 Main Street, Springfield, MA 01103

GOVERNOR

Hon. Michael S. Dukakis, Governor of the Commonwealth of Massachusetts,
State House, Boston, Massachusetts 02133

MASSACHUSETTS LEGISLATORS

STATE SENATORS

Hon. Roger L. Bernashe, 344 Prospect Street, Chicopee, MA 01013
Hon. Stanley J. Zarod, 537 Main Street, Indian Orchard, MA 01051
Hon. Alan D. Sisitsky, 54 Draper St., Springfield, MA 01108

STATE REPRESENTATIVES

Hon. Arthur J. McKenna, 652 Chestnut Street, Springfield, MA 01107
Hon. Sean Francis Cahillane, 141 Phoenix Terrace, Springfield, MA 01104
Hon. James L. Grimaldi, 102 Florence Street, Springfield, MA 01105
Hon. Raymond A. Jordan, Jr., 51 Goldenrod Street, Springfield, MA 01109
Hon. Anthony M. Scibelli, 200 Maple Street, Springfield, MA 01105
Hon. Richard P. Roche, 29 Standish Street, Springfield, MA 01108
Hon. Rudy Chmura, 71 Chauncy Street, Springfield, MA 01129
Hon. Theodore J. Trudeau, 19 Pearl Lane, Wilbraham, MA 01095

Office of the Chief of Engineers, HQDA(DAEN-CWP-E). James Forrestal Bldg., Washington, DC 20314

Resident Member, Board of Engineers for Rivers and Harbors, Kingman Building, Fort Belvoir, VA 22060

Director, Coastal Engineering Research Center, Kingman Building, Fort Belvoir, VA 22060

Director, U.S. Army Engineer Waterways Experiment Station, P.O. Box 631, Vicksburg, Mississippi 39181

Director, Institute for Water Resources, Corps of Engineers, Hoffman Building, Room 216, 2461 Eisenhower Avenue, Alexandria, VA 22314

Mr. R. Frank Gregg, Chairman, New England River Basins Commission, Room 205, 55 Court Street, Boston, MA 02108

Chairman, New England Regional Commission, 55 Court Street, Boston MA 02108

The Administrator, Soil Conservation Service, U.S. Dept. of Agriculture, Washington, DC 20250

Director, Northeast Regional Technical Service Center, Soil Conservation Service, U.S. Dept. of Agriculture, 7600 West Chester Pike, Upper Darby, PA 19082

Regional Forester and Area Director, Forest Service, U.S.Dept. of Agriculture, 6816 Market Street, Upper Darby, PA 19082

Water Resources Coordinator, Dept. of Commerce, 6010 Executive Blvd., Rockville, MD 20852

Director, Boston Business Services Field Office, Bureau of Domestic Commerce, 441 Stuart Street, Boston, MA 02116

Assistant Secretary for Economic Development, Dept. of Commerce, Washington, DC 20230

Regional Director, Atlantic Regional Office, Economic Development Administration, 320 Walnut Street, Philadelphia, PA 19106

Associate Director, Hydrology, National Weather Service, Office of Hydrology (W2), NOAA, Dept. of Commerce, Silver Spring, MD 20910

Regional Hydrologist, Eastern Region, NOAA National Weather Service, Dept. of Commerce, 585 Stewart Avenue, Garden City, NY 11530

Director, Atlantic Marine Center, National Ocean Survey, NOAA, U.S. Dept. of Commerce, 439 West York Street, Norfolk, VA 23510

Regional Director, National Marine Fisheries Service, U.S. Dept. of Commerce, Federal Bldg., 14 Elm Street, Gloucester, MA 01930

Regional Economics Division, Office of business Economics, U.S. Dept. of Commerce, Washington, DC 20230

The Surgeon General, USPHS/DHEW, 330 Independence Avenue, SW, Washington, DC 20201

Regional Director, PHS Region 1, DHEW, JFK Federal Bldg., Boston, MA 02203

Federal Insurance Administrator, Dept. of Housing & Urban Development, 451 7th St., SW, Washington, DC 20410

Regional Administrator, Region 1, U.S. Dept. of Housing and Urban Development, Room 800, JFK Federal Bldg., Boston, MA 02203

Regional Coordinator, Northeast Region, U.S. Dept. of Interior, 2003 J JFK Federal Bldg., Boston, MA 02203

Chief, Eastern Field Operation Center, Bureau of Mines, U.S. Dept. of Interior, 4800 Forbes Avenue, Pittsburgh, PA 15213

Regional Director, Northeast Region, Bureau of Outdoor Recreation, U.S. Department of Interior, Federal Bldg., 600 Arch Street, Philadelphia, PA 19106

Chief Hydrologist, Geological Survey, U.S.Dept. of Interior, Washington, DC 20242

Regional Hydrologist, Geological Survey, U.S.Dept. of Interior, Arlington Towers, Arlington, VA 22209

Director, Northeast Region, National Park Service, Dept. of Interior, 143 South Third Street, Philadelphia, PA 19106

Regional Director, Region 5, Bureau of Sport Fisheries and Wildlife, U.S. Dept. of Interior, U.S. Post Office and Courthouse, Boston, MA 02109

Director, Office of Water Resources Research, Dept. of Interior, Washington, DC 20240

DOT Coordinator for Water Resources, U.S. Dept. of Transportation (AWL/83), 400 Seventh Street, SW, Washington, DC 20591

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Regional Federal Highway Administrator, Region 1, 4 Normanskill Blvd., Delmar, NY 12054

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Regional Administrator, Region 1, EPA 2303 JFK Federal Bldg, Boston, MA 02203

Chief, Bureau of Power, Federal Power Commission, Washington, DC 20426

Regional Engineer, Federal Power Commission, Room 2207, 26 Federal Plaza, New York, NY 10007

Chairman, Council on Environmental Quality, 722 Jackson Place, NW, Washington, DC 20006

U.S. Department of Agriculture, Soil Conservation Service, 29 Cottage Street, Amherst, MA 01002

U.S. Department of Agriculture, Soil Conservation Service, Mansfield Professional Park, Storrs, CT 06268

U.S. Department of Agriculture, Soil Conservation Service, Federal Bldg., Durham, NH 03824

MASSACHUSETTS OFFICIALS, INTERESTED GROUPS AND INDIVIDUALS

Mr. Charles F. Kennedy, Director and Chief Engineer, Massachusetts Water Resources Commission, 100 Cambridge Street, Boston, MA 02202

Mr. Allen H. Morgan, Massachusetts Audubon Society, South Great Road, Lincoln, MA 01751

League of Women Voters of Massachusetts, 120 Boylston Street, Boston, MA 01751

Mr. John F. Dolan, Research Director, State House, Room 473A Boston, MA 02116

Dr. Evelyn F. Murphy, Secretary of Environmental Affairs, Executive Office of Environmental Affairs, State Office Bldg.,100 Cambridge St., Boston, MA 02202

Mr. Emerson Chandler, Massachusetts Water Resources Commission, Room 1901, 100 Cambridge Street, Boston, MA 02114
Mr. Louis S. Hambly, Massachusetts Division of Fisheries & Game, Field Headquarters, Westboro, MA 01581
Mr. Burton E. Shaw, Office of Planning and Program Coordination, Commonwealth of Massachusetts, 100 Cambridge Street, Boston, MA 02202
Mr. Bernard B. Berger, Chairman, Water Resources Research Center, University of Massachusetts, Room 206, Munson Hall, Amherst, MA 01002
Massachusetts Department of Commerce & Development, State House Bldg., 100 Cambridge Street, Boston, MA 02202
Massachusetts Department of Community Affairs, Room 1403, State Office Bldg., 100 Cambridge Street, Boston, MA 02202
Planning Director, Lower Pioneer Valley Regional Planning Commission, 1499 Memorial Avenue, Fitchburg, MA 01469
Associated Industries of Massachusetts, 4005 Prudential Tower, Boston, MA 02199
Trout Unlimited, c/o Morton Goldfader, 6 Kinney Drive, Worcester, MA 01602
Massachusetts Wildlife Federation, Thomas P. Magee, Secretary, 32 Mozart Street, Jamaica Plain, MA 02130
Massachusetts Association of Conservation Commissions, 84 State Street, Boston, MA 02109
Mr. Thomas R. Darcy, President, Massachusetts Association of Conservation Districts, 147 Beechwood Road, Westwood, MA 02090
Massachusetts Forest and Park Association, One Court Street, Boston, MA 02108
The Trustees of Reservations, 224 Adams Street, Milton, MA 02186
Mayor, City of Chicopee, Chicopee, MA
Postmaster, City of Chicopee, Chicopee, MA
Connecticut River Watershed Council, Inc., 497 Main Street, Box 89, Greenfield, MA 01301
Mayor, City of Springfield, Springfield, MA
Postmaster, City of Springfield, Springfield, MA
Mr. Robert Oakes, Planning Dept., City Hall, Springfield, MA
Mr. Marc E. Webb, Director, Department of Planning and Development, City Hall, Chicopee, MA 01013
Mr. David Standley, Commissioner, Dept. of Environmental Quality Engineering, Leverett Saltonstall Bldg., 100 Cambridge St., Boston, MA 02202

APPENDIX 2: LETTERS OF COMMENT

WILLIAM C. SULLIVAN
mayor

office of the mayor
CITY OF SPRINGFIELD,
MASSACHUSETTS, 01103
AREA CODE (413) 736-2711

June 7, 1976

Mr. Lawrence J. Bergen, Chief
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
Department of the Army
Policy & Long Range Planning Branch
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Mr. Bergen:

Springfield Riverfront Dikes

Apparently, our existing riverfront dikes (68.6' above sea level) would not be adequate to protect us against a "Standard Project Flood" (SPF). This SPF is very unlikely, (¼ of 1% chance in any year) but it is the basis for planning used by the Corps of Engineers.

Although the flood level generated by the SPF would only be 1.2 feet over out existing dikes, your agency says that we must increase their height by 4.2' at a cost of $8 million. To document this further, a "Level C" economic feasibility study has been authorized and funded.

Therefore, I respectfully recommend that:

1. The "Level C" study be started immediately.

2. The "Level C" study document project costs of increasing the dikes 1.2', 2', 3' and 4.2' rather than just the Corps automatic 4.2'.

3. The City's share be specified.

If you have any questions in this regard, please contact my office or Principal Planner Robert Oakes in my Planning Department.

Sincerely yours,

William C. Sullivan
Mayor

amd

UNIVERSITY OF MASSACHUSETTS
AMHERST · BOSTON · WORCESTER

WATER RESOURCES RESEARCH CENTER
OFFICE OF THE DIRECTOR
GRADUATE RESEARCH CENTER
AMHERST, MASSACHUSETTS 01002

Larry Bergen
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Ma. 02154

January 17, 1977

Dear Larry:

I received the "Announcement of Initiation..." of the Springfield study dated December 30, and, true to my past positon and my desire to act as a responsible taxpayer, I was about to fire off a protest letter about wasting taxpayers' money on an unneeded study.

I've thought better of it, and have decided instead to write you a frank letter about what bothers me. I disagree with the whole notion of retarding or walling-off flood waters. These actions compound a problem because they encourage people to make capital commitments in areas they should avoid and thus to increase catastrophic potential. Therefore I'm opposed to the dike and flood wall/elevation study because you might find a legally valid reason for elevating.

Having taken that basic position however, it may surprise you to know that I think the Corps has failed to take advantage of a basic economic fact. At no meeting of the CG, SMT, or any other group have I heard you or John Smith punch holes in NERBC's Staff Memo of July 11, 1975.

That memo argues that the existing dikes will be there indefinitely, and that therefore COE cannot rationally use "without" benefits after 1990. I believe that point is valid, and that the Corps' insistence on using the 50-year-life-of-the-project argument was not only not logical/rational, but greatly damaged the Corps' credibility in the eyes of those who listened to the arguments.

But that memo is itself not logical. It takes the Corps' figures on annual costs and average annual flood reduction benefits of the raised dikes only, thus yielding equivalent cost figures and greatly reduced benefit figures, reducing the B/C ratios way below unity. That seems logical, but it's not, because by using the Corps' figures it adopts the 50-year-life assumption which it wishes to avoid. Thus, for example, raised dikes in Damage Zone C-14 would yield benefits of $218,000 in average annual flood reduction while "costing" $3,064,000 per year in maintenance and amortization. However, the latter figure is based on a 50-year amortization, the very standard of impermanence which the memo purports to challenge!

If, as NERBC contends, dikes (with legally required maintencance) are substantially permanent structures, then use of a 50-year amortization schedule to compute costs is unwarranted. Suppose, for example, we were to use a 200-year life assumption. Then, not counting maintenance, the figures in Table 1 of the 7/11/75 Memo would approach 1/4 of what they are in that Table. (Obviously, interest would prevent an exactly proportionate reduction.) By the time we reached a level of expected life near 1,000 years, the costs in Damage Zone C-14 would approach comparability with flood reduction benefits. (I haven't made the computations since I don't know how much of the $3,064,000 annual cost in Table 1 is for maintenance.)

If NERBC staff insists that dikes, properly maintained, are, for all intents and purposes, permanent structures (and I see no good reason to question that assumption as long as they are not overtopped), then to be consistent they would have to amortize front end costs over an indefinite period of time, thus approaching zero annual average costs. Under such a computational format, almost any amount of net annual benefits would produce a satisfactory B/C ratio. (However, as I indicated earlier, I do not count development of low-lying land behind dikes as a benefit, and I do not think that rational calculation can produce net benefits. So do not misinterpret this paragraph as an advocacy of this dike study or any dike study. Until B/C analysis can take into account the irrational, thoughtless, or selfish actions of man, I don't trust B/C analysis as a tool to justify anything.)

Now I recognize that you may be aware of all this. I also recognize that you have to go by the rules--to accept "official truth". But this does not excuse the Corps from creating an image of irrationality or mindless bureaucracy. I think the Corps' insistence on arguing the benefits side of things showed very poor judgment. How could you argue that for computational purposes the dikes won't be there in 1990 and still expect to maintain your public credibility? That's the question that really puzzles me. Furthermore, even though the Corps may have to go by the rules and regulations, I see no reason for keeping any misgivings the agency may have about them under wraps. The Corps is the most rapidly responding agency I have had occasion to question, but its responses often increase the communication problem because it tends to rationalize rather than to spell out the irrational features of the rules it must live by.

Having gotten this off my chest, I feel much better than I would have had I responded to the December 30 announcement with the "position paper" I initially felt like sending. In broadest terms, that paper would have made the following point: Harrison, Chandler and others keep talking about how the major damage centers "have no other option". Well they have. In the absence of an arguable threat to life, they can accept the existing level of "protection". Perhaps in some future giant flood they'll suffer for past failure to come to terms with nature. But to continue to relieve them incrementally from responsibility for their own decisions is, I believe, a certain way to compound past errors.

I drop elaboration of this argument both because I am sure the Corps has heard it before and because, regardless of anything I might say, I'm sure the study will be undertaken. (I should argue with Congress for having authorized it.)

There is another reason for responding this way. I feel that the Corps has the potential clout and competence to do something about the problem of making planning rules conform to rational standards of procedure. If, for example, a legal requirement conflicts with good sense or logic, what is to prevent the agency from conforming, but then showing why the requirement yields misleading results and what might be the result of a different, more rational procedure?

Such a procedure might have two important consequences. It might bring those responsible for illogical or inconsistent rules to the realization that a change is in order, and it would undoubtedly gain the Corps considerable admiration as an agency willing to break out of the bureaucratic mold which features slavish devotion to method irrespective of good sense.

I'm not asking anyone to put his job on the line. It seems to me that the Corps' record of encouraging innovative thinking is good. The trouble is that it appears to come from the top. What I'm suggesting is that NED's planners (people with field experience) shake up the directorate to shake up Congress, OMB, or whatever. Maybe this occurs somewhat now, but not enough to prevent the agency from having to defend what I believe we both recognize as indefensible "official truths" about the life of dikes.

Sincerely,

Ed Kaynor

Edward R. Kaynor
Staff Associate

WILLIAM C. SULLIVAN
MAYOR

office of the mayor
CITY OF SPRINGFIELD,
MASSACHUSETTS, 01103
AREA CODE (413) 736-2711

February 15, 1977

John P. Chandler
Colonel, Corps of Engineers
Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Chandler,

I have been informed of The Massachusetts Steering Committee's request to participate in the study to determine the feasibility of raising Springfield's dikes.

The City of Springfield supports the efforts of The Steering Committee to coordinate activities on matters relating to the Connecticut River and to provide advice and guidance to agencies conducting flood management studies. I am certain you will benefit from their input during the course of your study in Springfield.

Yours truly,

William C. Sullivan
Mayor
City of Springfield

WCS/ft

MASSACHUSETTS STEERING COMMITTEE ON CONNECTICUT RIVER

BARBARA J. GARVEY, Chairperson
City Council Chambers
City Hall
Springfield, Massachusetts 01103

February 15, 1977

John P. Chandler
Colonel, Corps of Engineers
Division Engineer
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Chandler:

Your announcement of initiation of a study to determine the feasibility of raising the existing flood control system in Springfield, Massachusetts concludes with a request for comments concerning the study.

It is our belief that the successful management and conservation of the Connecticut River and its resources is ultimately more important to the region as a whole than the desires of any particular community, and that such conservation and management cannot be achieved through uncoordinated efforts.

With this in mind, we wish to draw your attention to the Massachusetts Steering Committee for the Connecticut River Valley. The Steering Committee, composed of the Chief Executives of governments of valley communities, or their designees, was created for the purposes of taking an active role in the decision-making process on issues, proposals and matters of interest affecting the River valley, and to insure coordination among communities.

At its February 9 meeting, the Steering Committee voted to create a sub-committee to participate in the various flood management studies now underway or proposed for Connecticut Valley communities. These include the Section 73 studies, as well as the dike raising study for Springfield. We believe the sub-committee is an excellent mechanism to help facilitate communication and coordination between the Corps of Engineers and those communities which will be affected - directly or indirectly - by projects involving the Connecticut River.

As the lead agency in the Springfield study, we look forward to your cooperation in keeping us informed of its progress.

Yours truly,

Barbara C. Garvey

Barbara Garvey
Chairperson, Massachusetts Steering Committee
on Connecticut River

/jc

CC: NERBC
Mayor William C. Sullivan

WATER RESOURCES INVESTIGATION

CONNECTICUT RIVER BASIN

SPRINGFIELD, MASSACHUSETTS

ATTACHMENT TO PLAN OF STUDY

SCHEDULE OF WORK AND BUDGETARY DATA

OCTOBER 1977

Reference ER 11-2-101, which states that: Budgetary Information is not to be released outside the Department of the Army

TABLE OF CONTENTS

Paragraph	Subject	Page
1	General	1
2	Constraints and Controls	1
3	Preparation of Reports	2

EXHIBITS

Number	Subject
1	Study Cost Estimate (FY Stages)
2	Study Activities
3	Milestones
4	Work Sequence Diagram

ATTACHMENT

1. General. The Springfield Local Protection Study, a Level C feasibility study of survey scope, will research the need for providing a higher degree of flood protection primarily for that portion of Springfield already protected by the existing system constructed subsequent to the record March 1936 event. Initial contacts with local officials have indicated that additional flood control was the major concern of residents, therefore, emphasis will be placed on developing alternative plans both structural and non-structural to increase the level of protection.

Estimates of cost for each major element of the study are shown in Exhibit 1. A breakdown of anticipated funding for these elements by fiscal year is shown in Exhibit 2. Exhibit 3 delineates the various items of work within each major element, while Exhibit 4 presents a graphic description of anticipated expenditures, checkpoint dates and milestone dates.

2. Constraints and Controls. The following controls will be utilized throughout the study period:

a. Initial funds of $79,000 were provided for Fiscal Year 1977 work included initiation of the study effort, initial public contacts and an existing data search, complete a Plan of Study and also for the development of alternate plans for additional flood control and related water and land resources. Environmental studies will be initiated and engineering plans will be formulated including project costs and economic justification. In addition, the original damage surveys completed after the March 1936 event will be updated to reflect the significant physical changes which have occurred during the past forty years. Continuous public involvement will be maintained throughout the study and a formulation stage public meeting will be held in October 1977 to insure compatibility with the needs and desires of the local interests.

b. In Fiscal Year 1973, $81,000 will be required to refine the development of alternate plans and to accomplish the development of detailed plans. A system of accounts for the multi-objective framework will be prepared during this stage. Also, final iterations of the four functional tasks will be made to determine a justified plan of action which satisfies the study objective and serves to best meet the needs and desires of local interests. If no plans of imporvement are reasible a negative report will be prepared.

c. All items of the study will be in accordance with the regulations of the Corps of Engineers. Special attention will be given to studies concerning the degree of protection, net maximization of benefits, and environmental enhancement.

d. All items of the study will be in accordance with the regulations of the Corps of Engineers. Special attention will be given to studies concerning the degree of protection, net maximization of benefits, and environmental enhancement.

3. Preparation of Reports. The Plan of Study contains the specifications for the investigation and methods to be used, physical work to be accomplished, precision and accuracy required, schedules to be made and coordination to be effected. A draft feasibility report, to be prepared in advance of the Stage III checkpoint conference will contain the conclusions reached after completion of the following items of work:

Hydrologic design related to required height of protection
Foundation and materials investigations
Design and Cost Estimates
Economic Studies and Damage Surveys
Effects assessment and environmental analysis
Real Estate Studies
Benefit ot Cost Analysis
Description of selected plan
Conclusions

The final report will be prepared and submitted to OCE after the Stage III public meeting is held. Submission of the report is scheduled for September 1978.

PLAN OF STUDY
SPRINGFIELD LOCAL PROTECTION
MODIFICATION STUDY

STUDY COST ESTIMATE

COST CLASSIFICATION		CURRENT COST ESTIMATE	STAGE I FY-77	STAGE II FY-77	STAGE II FY-78	STAGE III FY-78	STAGE IV FY-79
.01	Public Involvement	13,000	1,000	2,000	3,000	3,000	4,000
.02	Institutional Studies	2,000	0	0	1,000	1,000	0
.03	Social Studies	4,000	1,000	0	1,000	1,000	1,000
.04	Cultural Resource Studies	2,000	0	0	0	1,000	1,000
.05	Environmental Studies	7,000	1,000	1,000	1,000	2,000	2,000
.06	Fish and Wildlife Studies	2,000	0	0	1,000	1,000	0
.07	Economic Studies	33,000	1,000	28,000	1,000	2,000	1,000
.08	Surveying & Mapping	2,000	0	0	1,000	1,000	0
.09	Hydrology & Hydraulics	8,000	1,000	1,000	0	5,000	1,000
.10	Foundations & Materials	4,000	0	1,000	0	3,000	0
.11	Design & Cost Estimates	23,000	2,000	3,000	6,000	10,000	2,000
.12	Real Estate Studies	6,000	0	1,000	1,000	4,000	0
.13	Study Management	5,000	1,000	1,000	1,000	1,000	1,000
.14	Plan Formulation	14,000	2,000	1,000	3,000	6,000	2,000
.15	Report Preparation	6,000	1,000	1,000	1,000	2,000	1,000
.30	Supervision & Administration	39,000	4,000	12,000	4,000	13,000	6,000
	TOTAL	170,000	15,000	52,000	25,000	56,000	22,000

Exhibit 1

PLAN OF STUDY

SPRINGFIELD LOCAL PROTECTION PROJECT

MODIFICATION STUDY

STUDY ACTIVITIES

Cost Class	Feature
.01	PUBLIC INVOLVEMENT
	Establish Coordination
	Preliminary Identification of Problems & Needs
	Public Contact & Information Bulletins
	Arrangement for Formulation Public Meeting
	Formulation Public Meeting
	Arrangements for Late Stage Public Meeting
	Late Stage Public Meeting
	Review of Impact Reports by Other Agencies
.02	INSTITUTIONAL STUDIES
	Analysis of Existing Institutional Framework
	Assessment of Ways and Means to Implement the Recommended Plan
.03	SOCIAL STUDIES
	Attitude Survey of Local Residents Regarding Preliminary Alternatives
	Cultural and Historic Studies
	Survey of Population Characteristics
	Housing Studies
	Recreation and Leisure Studies
	Studies of Community Cohesion
.04	ARCHEOLOGICAL STUDIES
.05	ENVIRONMENTAL STUDIES
	Inventory of Baseline Environmental Resources
	Preliminary Effects Assessment & Environmental Study & Analysis
	Effects Assessment and Environmental Analysis
	Fish and Wildlife Studies
	Enhancement and Mitigation Studies
	Recreation Studies
	Environmental Report
	Effects Assessment Report
	Preliminary Environmental Impact Statement
	Statement of Findings

EXHIBIT 2

Cost Class	Feature
.06	ECONOMIC STUDIES
	Preliminary Economic Base Study
	Employment and Labor Force Study
	Land Use Study
	Business and Industrial Development Survey
	Population Projections and Other Demographic Studies
	Flood Damage Surveys
	Benefit/Cost Analysis
	Economic Report
.07	SURVEYING AND MAPPING
	Aerial Topographics
.08	HYDROLOGY AND HYDRAULICS INVESTIGATIONS
	Determination of Water Resource Capability and Generalized Hydrologic Relations
	Preliminary Hydrologic Design and Field Reconnaissance
	Hydrologic and Hydraulic Design
	Hydrology and Hydraulics Report
.09	FOUNDATIONS AND MATERIALS
	Field Reconnaissance
	F&M Investigations
	F&M Report
.10	DESIGN AND COST ESTIMATES
	Field Reconnaissance
	Preliminary Design and Cost Estimates
	Design and Cost Estimates
	Design and Cost Estimate Report
.11	REAL ESTATE STUDIES
	Preliminary Real Estate Studies
	Real Estate Report
.12	STUDY MANAGEMENT
	Cost Apportionment, Scheduling and Other Management Functions
	Checkpoint Meetings and Preparation

Cost Class	Feature
.13	PLAN FORMULATION
	Problems and Needs Development
	Alternative Development
	Formulation Studies
	Public Involvement Strategies
	Impact Assessments and Evaluation
.14	REPORT PREPARATION
	Preparation of Draft of Main Report
	Prepare and Reproduce Main Report
.20	OTHER STUDIES
.30	SUPERVISION AND ADMINISTRATION
	Draft Review
	S&A

SPRINGFIELD LOCAL PROTECTION

STUDY MONITOR MILESTONES

Stage I Planning	Schedule
(1) Study Initiation (Public announcement of study initiation and/or notice of Public meeting)	76-12
(2) Approval of Plan of Study by Division/OCE	77-11
Stage II Planning	
(3) Submission of Stage II Documentation to Division	78-02
(4) Stage II Checkpoint Conference	78-03
(5) Completion of Action on Memo for Record	78-04
Stage III Planning	
(6) Submission of Draft Survey Report and Draft EIS to Division	78-05
(7) Stage III Checkpoint Conference	78-09
(8) Completion of Action on Conference Memor for Record	78-10
(9) Coordination of Draft Survey Report and Draft EIS	79-02
(10) Submission of Final Survey Report and Revised Draft EIS to Division	79-03
(11) Release of Division Engineer's Public Notice and Submission of Report to BERH	79-03

EXHIBIT 3

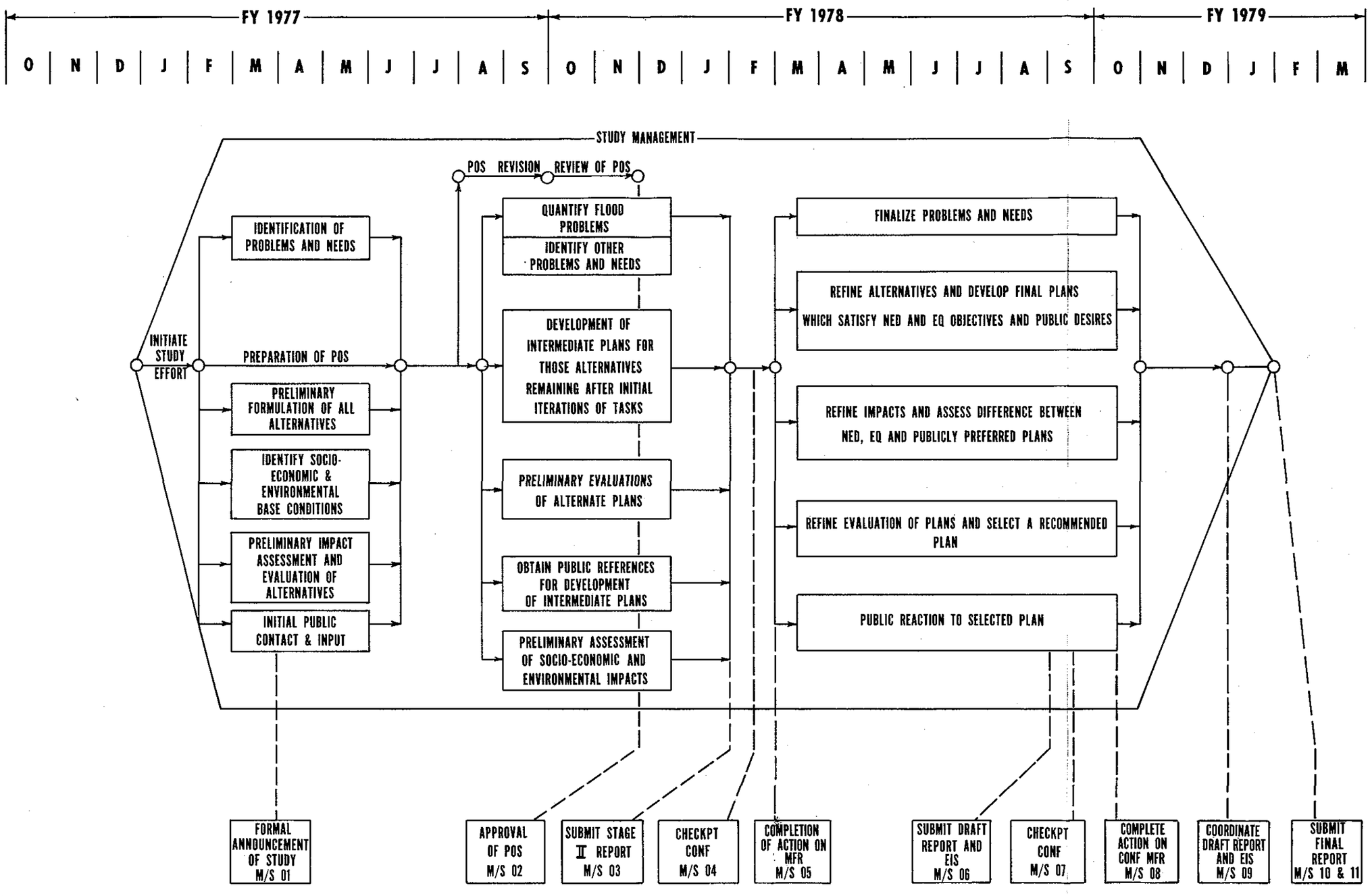

EXHIBIT 4
Work Sequence Diagram
Springfield Modification Study